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PUBLIC HEALTH QUALITY MEASUREMENT: Concepts and Challenges[1]

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■ **Abstract** Public health agencies increasingly are recognizing the need to formally and quantitatively assess and improve the quality of their programs, information, and policies. Measuring quality can help organizations monitor their progress toward public health goals and become more accountable to both the populations they serve and policy makers. Yet quality assessment is a complex task that involves precise determination and specification of useful measures. We discuss a well-established conceptual framework for organizing quality assessment in the context of planning and delivery of programs and services by local health departments, and consider the strengths and limitations of this approach for guiding quality improvement. We review several past and present quality measurement–related initiatives designed for public health department use, and discuss current and future challenges in this evolving area of public health practice.

INTRODUCTION

The mission of the public health system in the United States is to promote and protect the nation's health. Historically, the public health system has achieved much success in pursuing this mission (2). However, future gains will likely depend upon the system's ability to continually transform services and programs to effectively meet evolving population health needs. A commitment to quality is one of the cornerstones of continued success in public health practice. As such, quality assessment tools can be used to measure and promote the quality of public health activities, which ultimately affect the public's health through programs, information, and policies aimed at individuals and population groups.

Many industries and institutions, other than public health departments, have recognized the value of utilizing quality assessment tools and quality improvement methods (20, 29, 39, 40), and comparable efforts are being implemented within the personal health care system (12, 18, 35, 41, 47, 60, 68, 69, 71). Similarly, many public health agencies have recognized the potential benefits of quality assessment and improvement, and efforts are under way to institute measurement-based assessments to monitor practice performance (11, 48, 59, 79). Although few evaluations have been undertaken to determine the effectiveness of quality assessment and improvement initiatives in public health, there is some qualitative, if not quantitative, evidence that these efforts are improving public health services. For example, both Texas and Illinois have reported positive experiences with initiatives measuring local health department (LHD) performance. In Texas, quality measurement within LHDs fostered team building, role clarification among individuals and programs, and communication with external audiences (28). Similarly, in Illinois, LHDs reported an increased understanding of internal strengths and weaknesses and of community health problems (79). Population-based quality measurement also can benefit state public health programs: for example, measures of participant satisfaction have informed quality improvement attempts in North Carolina's Women, Infants, and Children (WIC) Program (26).

Incorporating quality measurement into public health can be challenging. Part of the difficulty is the scarcity of background theory, research, evidence-based standards, and practical experience upon which public health professionals can draw to develop quality indicators (or measures) for public health practice. In this article, we attempt to fill this gap by discussing important concepts underlying quality measurement in public health, examining the range of activities that can be measured, providing an overview of existing quality measurement-related initiatives, and considering further steps to build and implement effective quality measurement systems. Our discussion focuses on the LHD because it has the primary responsibility for ensuring and improving the public's health; however, we also consider the broader public health system.

CONCEPTUAL OVERVIEW OF PUBLIC HEALTH QUALITY ASSESSMENT

The Terminology of Evaluation

The terms used in the literature to refer to quality and performance measurement often are not consistently applied, which can complicate the interpretation of measurement results and comparisons across locations (43). We summarize some of the terms commonly used to describe quality measurement. The Institute of Medicine (IOM) has defined *quality* of health care as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (44). *Quality assessment* in public health is the measurement of achievement of population health objectives and practices by a particular organization or a group of individuals. *Performance assessment*, on the other hand, tracks progress towards organizational objectives and can include measures not only of quality, but also of cost/efficiency (e.g., the number of people a program serves, the cost per service). Despite this distinction, "quality assessment" and "performance measurement" often are used interchangeably in the literature. We use the term "quality assessment" here because our discussion does not extend to measuring costs or efficiency. Indicators are the basic unit of quantitative quality assessment. Public health *quality indicators* are quantitative statements about the capacity (structure), actions (processes), or results (outcomes) of public health practices.

Defining the Range of Public Health Assessment

A working description of the range of public health activities (i.e., programs, information, and policies), broadly outlined in terms of public health functions or services, is a prerequisite for defining the content and boundaries of public health quality assessments. However, there is a potential pitfall in defining public health for measurement purposes—a definition that simply, and empirically, mirrors current tasks in some LHDs may lack generalizability to other LHDs or may inadvertently help perpetuate outdated services. This can be a problem, especially since over the past century the U.S. public health system has sometimes experienced difficulties in adjusting to changing population health needs (e.g., the AIDS epidemic) and in adopting technological transformations (e.g., information technologies) (54, 77).

Instead, an ideal description should have a theoretical basis, such as the one described in the Institute of Medicine's (IOM) 1988 report, *The Future of Public Health*. This report recommended that the public health system change from its traditional service-oriented perspective to a broader conceptualization involving three fundamental "core functions" of public health: assessment, policy development, and assurance (38). The assessment function means that LHDs are expected to monitor and analyze the health of various populations. The policy development

function involves formulating and promoting scientifically sound public health policies. The assurance function guarantees public health services (including personal healthcare) for everyone, by either encouraging or requiring another organization to perform the service or providing the service directly (24). When LHDs successfully carry out these core functions, the results are programs and services that meet the health needs of the local population.

In 1989, the Centers for Disease Control and Prevention, Public Health Practice Program Office (CDC-PHPPO) convened a workgroup to recast these somewhat abstract core functions into more measurable terms (24). The workgroup developed the "ten public health practices," which define each of the IOM's core functions in greater detail, by outlining key activities that an organization must perform to fulfill the three core functions of public health. Likewise, a similar detailed description of public health activities, termed the "ten essential services," emerged from the debate on health reform in the early part of the Clinton administration. The Office of the Assistant Secretary of Health began to form a consensus on public health activities in 1994; the Public Health Functions Working Group and Steering Committee (composed of U.S. Public Health Service agencies and other leading public health organizations) built on this work to develop the ten essential services (Table 1) (10, 63). As Table 1 shows, the range of public health activities described in the ten practices and the ten essential services differs only slightly. Unlike the ten practices, the ten essential services explicitly state the personal health responsibilities of public health agencies and recognize a role for research. Both sets describe key public health activities from a practical perspective, and thus can be used to guide measurement efforts (10).

Another useful conceptualization of public health activities, particularly as they are distinguished from primary care, divides the functions of public health agencies into primary, secondary, and tertiary prevention, and the target groups into average- and high-risk individuals and populations (72). In combining these categories, this taxonomy delineates the linkages between public and personal health functions. For example, secondary prevention by environmental monitoring of populations at average risk traditionally has been the purview of the public health system, whereas tertiary prevention in high-risk individuals conventionally has been that of the personal health system.

There are advantages and disadvantages to each of the conceptualizations of public health functions described in this section. The list of ten essential services is appealing because it is widely accepted and expresses the mission and goals of public health for a broad audience. Below we describe a framework for quality assessment designed to incorporate most models of public health functions.

Framework for Assessment

A conceptualization and working definition of public health functions or services drives the choice of domains for quality assessment, but in and of itself does not

TABLE 1 The ten public health practices and the ten essential public health services

Public health practices (24)	Essential public health services (10, 63)
Assessment	
• Assess the health needs of the community	• Monitor health status to identify and solve community health needs
• Investigate the occurrence of adverse health effects and hazards	• Diagnose and investigate health problems and health hazards in the community
• Analyze the determinants of health needs	
Policy Development	
• Advocate for public health, build constituencies, and identify resources in the community	• Mobilize community partnerships and action to solve health problems
• Set priorities among health needs	• Develop policies and plans that support individual and community health efforts
• Develop plans and policies to address priority health needs	
Assurance	
• Manage and coordinate resources and develop the public health system's organizational structure	• Assure a competent workforce—public health and personal health care
• Implement programs by ensuring or providing services	• Enforce laws and regulations that protect health and assure safety
• Evaluate programs and provide quality assurance	• Link people to needed personal health services and assure the provision of health care when otherwise unavailable
• Inform and educate the public on health issues	• Evaluate effectiveness, accessibility, and quality of personal and population-based health services
	• Inform, educate, and empower people about health issues
	• Research for new insights and innovative solutions to health problems

provide a framework (and method) for assessment. To find a measurement framework useful for organizing evaluations, we turn to the quality assessment work of Donabedian. Donabedian's framework divides quality into three dimensions: 1. *structural quality*, which assesses the organizational characteristics and resources of public health agencies (or the larger public health system); 2. *process quality*, which assesses what public health agencies do, although LHD functions can be difficult to measure; and 3. *outcome quality*, which assesses the influence of actions by public health agencies on the public's health (22, 62). In Figure 1, we adapt this framework for quality assessment of local public health systems and illustrate how structure, process, and outcome are related (50). Structural elements make processes possible, and processes, in turn, lead to short-term results (intermediate outcomes) and, ultimately, to community health outcomes. This framework can be used to evaluate the public health activities of both LHDs and

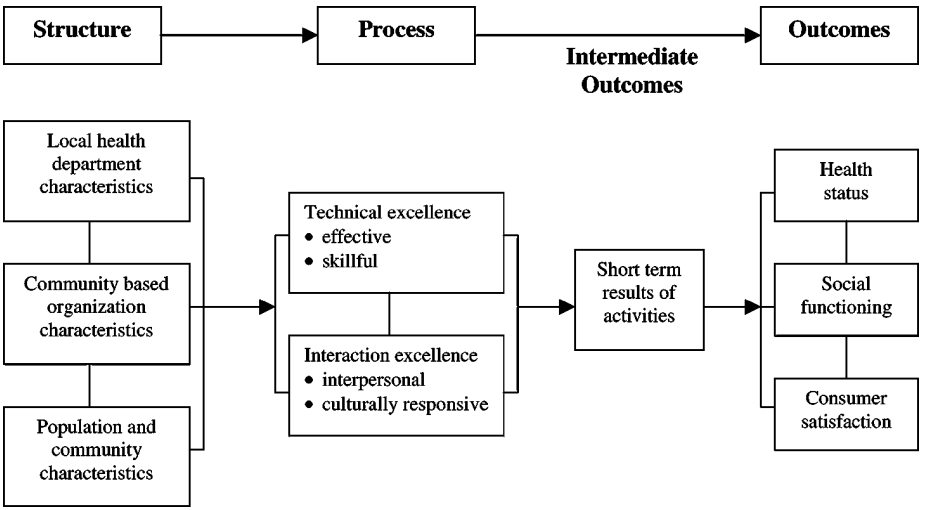

Figure 1 Framework for local public health system quality assessment. Dimensions of quality (*structure*, *process*, *outcome*) and aspects for assessment (*boxes*) are depicted. Characteristics of process quality (*bullets*) are listed within technical excellence and interaction excellence. The quality of both the planning and the delivery of programs and services may be assessed within this framework.

community-based organizations (CBOs, such as educational institutions, religious institutions, civic organizations, health providers, businesses), which together constitute the local public health system. Furthermore, it demonstrates the interconnectedness of various agencies' effects on public health outcomes and is consistent with a CDC-PHPPO framework that describes the function and infrastructure of the public health system (24).

In the columns of the figure, under each dimension of quality assessment—structure, process, and outcome—are boxes indicating aspects of public health *planning*, or decision-making, and the *delivery* of programs and services that can be measured using quality indicators. Structural aspects include population and community characteristics that can influence outcomes and that the local public health system may be able to affect, through lobbying or other means (e.g., the availability of government-sponsored health insurance among otherwise uninsured children, the tax on alcohol and tobacco products). Process quality may be evaluated on grounds of technical excellence, which applies to the execution of all activities, or interaction excellence, which refers to those programs and services that have contact with consumers of public health services (e.g., the public, other organizations). Intermediate outcomes are the short-term results of public health activities. The intermediate outcomes of planning are combinations of programs and services that aim to fulfill local health needs. Planning determines how resources (structure) will be used and how public health services will be delivered.

The intermediate outcomes of delivery are the direct, short-term results of these programs and services (e.g., immunization rates for vaccination programs). Ultimate community health outcomes include health status, social functioning, and consumer satisfaction.

The Donabedian framework aids in identifying quality measures within each core public health function or essential service. For example, if we chose the first essential service (see Table 1), "monitoring health status to identify and solve community health needs," we could conceive of structural measures [e.g., the presence of computerized tuberculosis (TB) tracking systems], process measures (e.g., the proportion of TB cases reported), and outcomes measures (e.g., rates of TB) for this domain. The following section describes in greater detail structure, process, and outcomes as they apply to public health.

The Dimensions of Quality Evaluation

STRUCTURE Structural quality assesses those organizational elements and resources of an LHD or the larger local public health system that affect its ability to meet community health needs and to promote healthy lives. The structural aspects of quality are necessary, although not sufficient, to facilitate the processes that affect outcomes (e.g., computers are necessary, but not sufficient, to conduct most epidemiological analyses). Structural quality can be divided into 1. inputs, which include personnel (e.g., the number of epidemiologists on staff), physical resources (e.g., computerized information systems, workspace), and financial resources; and 2. organization, which includes how resources are arranged and managed (e.g., administrative policies, the decision-making hierarchy, the particular mix of inputs used) (22).

In deciding which specific structural features to measure, it is important to focus on factors that are amenable to change and that affect processes (and thus outcomes). For example, whether an LHD compiles a registry of CBOs and their activities might be a good structural feature to assess because the registry could be used to improve the timeliness and comprehensiveness of LHD-led community health planning and such planning could ultimately affect health outcomes. Structural measures are particularly useful for developing and strengthening the infrastructure of a local public health system when capacity is insufficient to meet local needs. However, once the necessary infrastructure has been developed (e.g., there are a sufficient number of experienced epidemiologists on staff), structural indicators have limited value. Moreover, since they are more remote from outcomes than are other measures, structural measures provide limited information about the day-to-day actions of an organization, and thus are less useful for guiding quality improvement efforts.

PROCESS Process quality assesses what LHDs (or other agencies) do for or with population groups, organizations, and individuals, and how well they perform those actions. Process measures examine specific actions and provide timely information

about activities that can be changed to improve outcomes. Examples of process quality measures include the proportion of provider organizations that report more than 90% of measles cases to the LHD, the proportion of active TB case contacts that are traced and appropriately treated, and the proportion of small water systems that are inspected as frequently as state law specifies. It is best to choose process indicators that have a clear, causal link to outcomes; however, determining whether a process measure relates to and affects an outcome can be difficult (49). Ideally, the link between a process measure and outcome should be established through scientific evidence, although the evidentiary base is not always sufficient to form such a connection (14). In practice, a consensus of expert opinion often is used, despite the potential for introducing bias (15). In addition, a causal link is sometimes assumed when there is a strong logical connection between an action and its result. Causal models, in the form of analytic or logic frameworks, are useful tools to depict and clarify the determinants of problems in public health (13, 21).

As noted above, process quality has two main aspects: technical excellence and interaction excellence. Technical excellence, which refers to the application of science and technology to public health practice, means that programs and services are effectively planned and skillfully delivered. For quality assessment purposes, effective planning indicates that the health benefits expected from a chosen course of action exceed benefits from alternative strategies. Skillful delivery means proficiency in performance by the individuals and organizations involved.

Interaction excellence, which pertains primarily to service delivery, concerns the human behavioral aspects of activities and includes both humane interpersonal conduct and cultural responsiveness: is a personal interaction during a public health intervention or collaboration respectful, ethical, and responsive to the individual or organization involved and is the program or service delivered in a manner respectful of and responsive to the preferences and special circumstances of population groups and individuals? One example is whether program information is provided in the primary languages of all recipients.

Although many people find the assessment of day-to-day organizational tasks (e.g., the delivery of a program) intuitive, public health planning is more difficult to assess. For LHDs, planning involves complex decision-making to establish a set of programs and services that best meets the health needs of the local population, especially under constrained resources. LHD planning includes 1. resource allocation, in which the LHD plans to maximize health-related social welfare through its distribution of resources; and 2. intervention selection and coordination, in which the LHD, often in concert with community partners, implements specific programs in a way that meets health objectives for targeted populations effectively.

An assessment of planning results (intermediate outcomes) is feasible, although difficult, whereas planning processes are currently more challenging to evaluate. For example, the quality of the results of decision-making for resource allocation might be measured by calculating the dollars spent per preventable disability-adjusted life years (DALYs) for the most common causes of morbidity and mortality in a local area (3, 55). However, an assessment of the planning process involves

the much more complex evaluation of actions involved in public health decision-making, including, for example, whether goals and objectives are stated plainly, evidence-based community health interventions are identified systematically from the literature and the information is utilized, community input is elicited, competing interests are considered, available resources are identified, and the logic of the intervention strategy and its evaluation are defined clearly.

In addition, the process of public health planning is difficult to directly assess currently because of inadequate measurement methods and lack of general agreement on standards for community health interventions, although attempts to produce them are under way (76). Moreover, political and fiscal factors, such as constraints on the use of funds, necessarily influence planning decisions; therefore, for theoretical and practical reasons these factors are usually separated from evaluations of quality (22). Thus, although planning is an important LHD role and domain of assessment, the delivery of programs and services can be evaluated more readily. Furthermore, a successful program or policy suggests good planning, albeit indirectly.

OUTCOME Outcome quality assesses the influence of public health activities on community health. Public health outcomes can be divided into ultimate, or true, population health outcomes, and intermediate outcomes. Ultimate outcomes, the effects of public health activities on the health of a defined population, fall into three categories: 1. health status, which assesses the physical and mental status of a population (e.g., rates of motor vehicle accident deaths, measles, or depression); 2. social functioning, which assesses the ability of a defined population to function in society (e.g., rates of persons with disabilities living independently); and 3. consumer satisfaction, which assesses the response to public health services from a population or other stakeholder (e.g., client satisfaction with tobacco cessation programs) (62). Stakeholders, such as citizens, high-risk groups, health care providers, government policy makers, and health department staff, may all contribute unique and valid perspectives on the quality of LHD services from their own experience.

Consumer satisfaction can be an important component in determining how often population-based programs provide services and can help improve quality by motivating health departments to meet consumer needs (45). However, consumer ratings may not be reliable indicators of quality, particularly for public health activities, because consumers are not always able to determine whether services are appropriate or technically good (4), and the ratings may not reflect the outcome for the entire population at risk (for instance, some patients isolated for TB or treated for addictions may dislike programs that are effective and beneficial to the public and themselves).

Intermediate outcomes indicate the effects of public health activities on risk factors associated with population health status (62). They assess changes in health risks that are demonstrated or assumed to be associated with the health status of the community (e.g., teenage smoking rates, the proportion of children with high lead

levels, immunization rates, or measures of industrial toxins in the environment). Intermediate outcomes include the short-term results of programs and services, and they may, with appropriate caution, be used as proxy measures for true health outcomes (62). Intermediate outcomes can take many forms, reflecting the diversity of public health activities. For example, in health promotion programs, intermediate outcomes may include measures of change in knowledge (e.g., how HIV is transmitted), attitudes (e.g., toward condom use), and risk behavior (e.g., self-reported rates of condom use) (17, 27). Although the number of persons served by a program is generally not used as an indicator of quality, the proportion of a high-risk population served by an outreach program is often considered a feature of program quality (i.e., accessibility) and is thus used as an intermediate outcome.

Both process measures and intermediate outcomes are particularly useful in quality evaluation because 1. the lag between implementing public health services and changes in the rates of targeted health problems (such as cancers or heart disease) often extends to many years; 2. some important ultimate health outcomes occur infrequently (such as meningococcal meningitis outbreaks), whereas their associated processes and intermediate outcomes are more frequent; and 3. ultimate health status outcomes often are influenced by many factors outside the control of the public health system, whereas processes and intermediate outcomes are influenced more directly by the LHD and other public health organizations.

Outcomes can be used to evaluate the overall quality of a local public health system, agency, or intervention. However, to effectively use outcome indicators for quality assessment and improvement, the measures should be linked (e.g., using analytic or logic frameworks) to public health processes. If we do not know how our actions affect results, it is difficult to determine how to improve performance. In addition, external factors that affect outcomes must be taken into account in order to draw valid conclusions about the quality of outcomes. Other contributory factors (covariates or risk-adjustment variables) often affect outcomes but remain outside the control or influence of the LHD and the local public health system; these include both community and population characteristics (e.g., age and income distribution, school system quality, the number of liquor stores per capita, the price of tobacco products, and other social and economic factors), which make it difficult to determine the results of LHD activities. The effects of these covariates on health outcomes (e.g., the influence of age distribution on a community's most common causes of death) are important and, when possible, these variables should be measured in order to statistically adjust and compare outcomes over time or across LHD jurisdictions. Statistical adjustment involves predicting outcomes based on population characteristics and comparing the observed to the expected number of events. When adjusting outcomes for several variables simultaneously, regression models can be used in a manner that is analogous to the indirect standardization of mortality rates (16, 37). When adjustment for influential covariates is not possible, clearly stated caveats must accompany the interpretation of outcomes quality.

If an LHD has little or no control over an outcome measure, the LHD cannot be held fully accountable for that measure, and it is not a useful indicator of quality.

Nevertheless, an outcome indicator with low accountability can still be a useful measure of population health status. Measures of health status are used to inform the public and policy makers on issues in public health. Moreover, they can be used to define goals for public health, as has been done with *Healthy People 2000* and *Healthy People 2010* (82, 83).

OVERVIEW OF PUBLIC HEALTH MEASUREMENT INITIATIVES

Although many of the public health measurement systems described in this section have been widely used, they were not designed specifically for quality evaluation purposes. Nevertheless, a critical appraisal of their component measures and the way in which they fit into the theoretical framework described above can help guide future initiatives for quality measurement.

Early Initiatives

Initiatives designed to measure public health practice in the United States were first introduced in the early part of the twentieth century. The American Public Health Association (APHA) developed two important measurement tools: the APHA *Appraisal Form* and subsequently the APHA *Evaluation Schedule*. Both tools focused primarily on the services that LHDs and other agencies provided and were used to rate and compare LHD performance (77). The *Appraisal Form* is a means of voluntary self-evaluation that was developed in 1925 to formally assess citywide public health practices (8, 9). Used until the early 1940s, this tool gathered data and rated LHDs and other community health agencies on the type of activities (e.g., creating geographic maps of diseases) and the quantity of activities (e.g., the number of vaccinations given) that they provided. Also tracked were health department resources and regional mortality rates; however, this information was not used to compare LHD performance because it was considered to be too dependent on local circumstances and unmeasured covariates (8). In 1943, the *Evaluation Schedule* was developed to replace the *Appraisal Form* (6). This self-evaluation tool, which was used into the 1950s, measured the immediate results (intermediate outcomes) as well as the activities of local public health systems (33). The *Evaluation Schedule* provided more detailed quality assessment of LHDs by using more outcomes and process indicators and by endeavoring to measure, as objectively as possible, how well resources were used to meet local health needs (5).

These early instruments were quite complex. Both tools, particularly the *Evaluation Schedule*, used a mixture of 1. structural measures (e.g., the number of persons in a region per physician), 2. process measures (e.g., the percentage of reported syphilis case contacts examined by a physician), 3. intermediate outcomes measures (e.g., the percentage of children under two years of age who had received a smallpox vaccine), and 4. true health status outcomes measures (e.g., the number

of TB deaths per 100,000 people over a five-year period) (6). However, because both tools focus on the delivery of services, they did not examine whether LHD planning resulted in programs, information, and policies that appropriately met changing community health needs.

National Self-Assessment Tools

More recent measurement initiatives include self-assessment tools, which use performance measures to help LHDs evaluate their ability to perform public health functions, address local health needs, and guide community health planning efforts. The most widely used self-assessment tool is the *Assessment Protocol for Excellence in Public Health* (*APEX/PH*) (56). Developed by the National Association of County and City Health Officials (NACCHO), *APEX/PH* allows local health officials to assess the organizational management of their departments, provides a framework for working with the community and assessing its health status, and helps to promote the leadership of the LHD within the community (56). *APEX/PH* has multiple ready-made indicators designed to measure organizational capacity (structure) and also includes some process measures. (For example, a structural indicator for community health assessment is, "Does the health department annually compile or update a listing of health-related information systems and databases maintained by community organizations that operate within its jurisdiction?") The organization assesses the perceived importance of the indicator and the degree to which it currently is being met.

Building on lessons learned from the *APEX/PH* project, a new tool, *Mobilizing for Action through Planning and Partnerships* (*MAPP*), is being developed under NACCHO's guidance (57). This tool is intended to help communities improve health and quality of life through partnership mobilization and strategic action. The instrument enables communities to assess important community problems and strengths, the local public health system (using the *Local Public Health System Performance Assessment Instrument*, which is described later), the health status of the community, and forces of change. Local public health system indicators include a set of predefined measures of structure, process, and outcomes, but the tool provides flexibility in that it allows use of additional measures depending on local needs.

Model Standards is another widely used means of self-assessment developed by the APHA that is used to link the *Healthy People* national objectives to local efforts at health improvement (7). The tool employs easy-to-use worksheets that allow communities and LHDs to establish health objectives, and to identify programs, policies, and ideas for actions that will help them to achieve these goals. The instrument also suggests indicators to track progress. (For example, if the objective is to reduce tobacco use, interventions to achieve this goal are suggested: "By [date] the community will be served by smoking education programs, including: a) health provider programs, b) nonsmokers' rights campaigns . . . e) school curriculum programs." Suggested indicators for monitoring strategies

to reduce tobacco use include whether interventions "a-e" listed above have been implemented, or whether surveys that assess people's knowledge of smoking risks are being conducted.) Although the indicators that *Model Standards* provides lack detail, the process the tool employs can be useful for identifying aspects of the local public health system that need to be assessed.

State and Regional Assessments

Like national self-assessment tools, state and regionally developed LHD performance assessment systems are designed to guide community health planning and improve the infrastructure of local public health systems; however, they also can be used to aid state-level planning and policy development, guide funding decisions, and facilitate program evaluations (48). In 1997, at least 35 states were developing or conducting LHD performance assessments using methods ranging from externally developed assessment tools (such as *APEX/PH*) to internally and independently developed systems, or blends of the two (48, 84, 85). Typically, these regional LHD performance assessment protocols emphasize measures of structure and process (including access to services) (48), although they will probably incorporate more outcomes measures in the future. For example, the New York City Department of Health has developed a set of quality indicators for internal use that covers health department activities and includes mostly process measures; it also uses a smaller set of indicators for external (public) use that incorporates more outcomes measures (M. Merlino, personal communication). In addition, Los Angeles County is undertaking a comprehensive effort to develop key performance indicators for all major activities, and these include both process and outcomes measures.

Performance measurement also is used in state-based accreditation programs to determine whether LHDs are maintaining a predefined standard of practice. LHD accreditation efforts are well under way in the United States and seem to be gaining momentum (64). Illinois and Michigan, in particular, have developed extensive accreditation evaluation forms and have collected a broad range of population health data, including outcomes. Illinois based its LHD performance indicators on *APEX/PH* and the CDC's ten public health practices. Michigan also borrowed from *APEX/PH* and developed its own set of seven "core capacities" that is similar to the ten practices and ten essential services (51, 64). Most of the performance indicators included in both of these accreditation programs focus on LHD structure.

Population Health Outcomes-Focused Assessments

A number of initiatives utilize population health outcomes to measure public health performance and indirectly assess the quality of the public health system at the regional, state, and national levels. For example, in 1991 the CDC and the National Center for Health Statistics developed a consensus set of 18 health status indicators, based on the health goals set forth in *Healthy People 2000*, to help communities assess their general health status (1). The measures are those commonly used in

public health, for which data are readily available, such as the number of births to adolescents as a percentage of total live births or the race-/ethnicity-specific infant mortality rate. *Healthy People 2010* also includes a "core list of leading health indicators" (19, 61). These indicators, along with measures of access to care and health risks, form the basis of community health "report cards," which are expected to play a major role in local public health system planning in the future (23, 25). Many communities throughout the United States are developing community health report cards, often with LHD involvement. A recent national survey indicated that these report cards are at an early stage of development and use—only about half of the communities surveyed used pre-existing formats or the experience of others as a guide for development, and there were wide variations in quality and issues covered (25). Report cards, such as *Health Plan Employer Data and Information Set* (HEDIS), are used in a similar way to evaluate the quality of provider organizations in personal health care (36, 45, 58, 67).

Population health outcomes can be used to rate and compare the quality of local public health systems and LHDs over time if the appropriate evaluation methods are implemented. For example, an outcomes-focused appraisal method for LHDs and an outcomes-based method of assessing and comparing health status across communities have been developed for use in Florida (73, 74). The appraisal system collects data on 1. indicators of population health status (e.g., the infant mortality rate); 2. covariates, including community demographics (e.g., the age distribution), economic factors (e.g., the unemployment rate), and health resource characteristics (e.g., the number of primary care physicians); 3. indicators of LHD operating efficiency (e.g., costs per service and services per provider unit); and 4. "effectiveness" indicators, including community outcomes (e.g., incidence of measles) and measures of program impact (intermediate outcomes, such as immunization rates). Once collected, performance data can be adjusted to account for the effects of external variables and the results can be compared.

Although outcomes comparison systems assess both intermediate and ultimate outcomes, they often do not examine the process measures that describe in detail LHD activities. Thus, when a poor program result or health status outcome is found, it is hard to determine the source of the problem. In addition, when comparing outcomes, accurately estimating the LHD's influence versus that of the many external variables outside the LHD's control is very difficult, but important.

Function-Based Assessments

Other attempts to formulate measurement have concentrated on assessing the core functions of public health by focusing on key activities that indicate these functions have been achieved. *Healthy People 2000* made this shift toward assessment of core function explicit in Objective 8.14, which states that 90% of the U.S. population should be served by an LHD that is addressing effectively the three core functions of public health (82). Likewise, a similar emphasis continues in *Healthy People 2010* by ensuring that health agencies have the infrastructure to provide

effectively the ten essential public health services (83). Several researchers have studied compliance with the objectives of *Healthy People 2000* by developing surveys to measure how well LHDs provide the core functions of public health (34, 52, 53, 65, 66, 70, 78, 80, 81). The results from these studies strongly suggest that the LHDs surveyed were not completely fulfilling the core public health functions. Moreover, they reveal the need for a measurement initiative that examines decision-making processes (planning) to evaluate whether the appropriate organizational activities are being performed.

Aided by these research findings, the CDC-PHPPO is developing the *Local Public Health System Performance Assessment Instrument*, which is organized around the ten essential public health services and incorporates several measures from research on core function assessment (59). The instrument is part of the National Public Health Performance Standards Program, which is led by the CDC and aims to improve local public health system quality and performance, increase accountability, and strengthen the science base of public health practice. The instrument evaluates the capacity and performance quality of local public health systems and LHDs by surveying LHD representatives to determine whether important structural elements and processes are in place. Since the instrument assesses whether the local public health system uses available resources to effectively meet public health needs, it also indirectly reflects the quality of public health planning. While this instrument certainly will play an important role in building the capacity of the public health system, it relies heavily on the respondents' judgment rather than objective data and does not directly assess whether an LHD's set of services is most appropriate or how well it is provided.

CHALLENGES OF PUBLIC HEALTH QUALITY ASSESSMENT

Although the public health system in the United States has begun to utilize quantitative methods to measure the quality of its practices, many challenges remain for the implementation of quality evaluation systems. Currently, LHDs lack measurement systems that fully address and evaluate the steps an LHD takes to achieve its health objectives. Moreover, many existing indicator sets were developed for other purposes and therefore lack detailed measures that reveal the reasons for good or poor performances. To effectively evaluate and improve the quality of an LHD and community organizations that influence local public health, comprehensive and detailed assessment systems are needed that evaluate how well they address local public health responsibilities—a goal of assessment since the APHA *Evaluation Schedule* in the 1940s (6).

Ideally, a comprehensive quality assessment system would evaluate the full range of LHD activities, which can be quite variable, as well as an LHD's success in achieving the public health mission for both the planning and the delivery of programs and services. An assessment of LHD planning should promote the ability of these organizations to identify, develop, and implement programs and

services that appropriately address community health needs. Although objective, quantifiable indicators of LHD planning are currently limited, a research priority should be to investigate the methods and standards necessary to directly assess planning quality. On the other hand, measures of the delivery of public health programs and services can be created more easily. Detailed indicator sets for the delivery of programs and services can be developed locally and used to monitor and improve the quality of public health activities. Such monitoring should help ensure that LHDs are providing public health programs and services well.

Efforts are being made to improve public health performance measurement. For example, the IOM's *Assessment of Performance Measures for Public Health, Substance Abuse, and Mental Health* is designed to help states assess the performance of public health programs (62). This publication lists broadly applicable public health outcome measures and provides definitions, examples, and advice concerning structure and process performance measures. Nevertheless, barriers to creating, implementing, and benefiting from public health quality assessment systems remain.

First, an expanded public health evidence base is needed to provide more information about efficient and effective services. The U.S. Public Health Service is making a major effort to remedy this problem in its *Guide to Community Preventive Services*. The guide aims to fill this gap by summarizing current information about the effectiveness of strategies for community-based disease prevention and control (75, 76). It also provides recommendations on public health interventions and their delivery based on available evidence. Likewise, similar efforts to develop guidelines for community health interventions are under way in Canada (30). These resources will help guide public health practitioners in their decisions and should aid in the development of evidence-based public health quality indicators and assessment systems.

Public health quality assessment will be advanced by creating more concrete measures based on data. This will require better public health data collection systems, particularly at the local level. Primary data collection, though costly, provides invaluable information. For example, the Los Angeles County Health Survey records a wealth of public health data that are not available from other sources (46). Where possible, existing data sources should be used. The Behavioral Risk Factor Surveillance System is an example of a federal database that provides information relevant to population health (62); however, these data are often collected sufficiently only for larger LHD jurisdictions. Similarly, states often maintain databases that are updated periodically with information relevant to LHDs; however, these databases vary from state to state. Cooperative agreements with large provider groups such as managed care organizations could be another potential source of data, although such arrangements might be difficult to implement (31, 32, 42). Data tracking systems can be developed, or adapted, and applied locally to gather information for internal LHD activities. Access to these data should allow experienced local public health personnel and researchers with expertise in formulating systems for quantitative quality measurement to devise data-driven

measures sensitive to local needs and that capitalize on these local information resources.

Finally, improvements in the public health system's capacity to fulfill essential public health services should continue. Quality assessments will result in few improvements without a strong infrastructure that can respond to and integrate the results of evaluations. This need is addressed in *Healthy People 2010*, which defines new national objectives to improve the public health system infrastructure and achieve performance standards for essential public health services (61).

Despite these barriers, ongoing refinements and redefinitions of public health indicators will allow for evaluation of an increasingly broad range of public health activities, particularly as standards become available for public health practices. National and locally developed systems for quality assessment now emerging can be combined to promote LHD quality. Indicator systems such as the CDC's *Local Public Health Performance Assessment Tool* can be used to compare quality across LHD jurisdictions nationally, while specific LHD activities can be assessed by local systems. Experience from diverse industries including personal health services validates the utility of measurement systems in improving quality. The pursuit of quality assessment within the public health system holds equal promise of improved outcomes for public health.

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